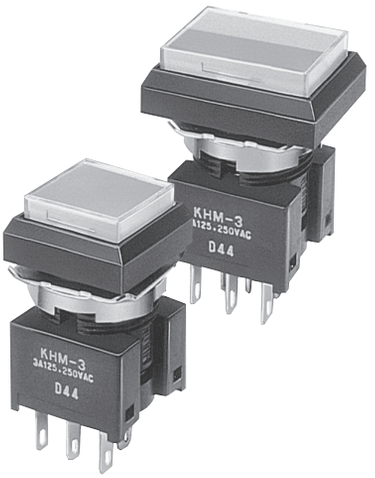
Sunmulon

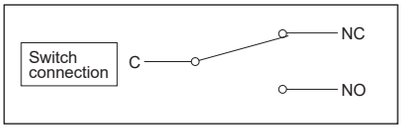
KH Illuminated Pushbutton Switch

KH

16 mm mounting hole, Oil and Water-Tight version to IP65.

- Depth behind panel：Only 22 mm
- LED Full-Face, Dual-Color, 2-Split-Face illumination available.
- Terminal：#110 Tab・Soldering, PCB
- Accessories：Guard cover





CHARACTERISTICS

Button Size		Square：□14.2 mm　Rectangle：14.2×20.2 mm	
Contact Material		Silver contact (Gold-plated)	Cross-bar contact
Rating (Resistive Load)		AC 125 V 3 A AC 250 V 3 A	AC 125 V 0.1 A DC 30 V 0.1 A
Insulation Resistance		More than 100 MΩ at DC 500 V	
Dielectric Strength		AC 1000 V RMS between NC and NO terminal AC 1500 V RMS between terminals and ground 50/60 Hz for 60 sec. at normal ambient temperature and humidity	AC 600 V RMS between NC and NO terminal AC 1500 V RMS between terminals and ground 50/60 Hz for 60 sec. at normal ambient temperature and humidity
Contact Resistance		Less than 30 mΩ (Initial value) at DC 6 V 1 A	Less than 50 mΩ (Initial value) at DC 6 V 0.1 A
Vibration Resistance		10 to 55 Hz, Amplitude 1.5 mm	
Mechanical Life	Momentary	More than 2,000,000 operations	
	Alternate	More than 200,000 operations	
Electrical Life (Resistive Load)		More than 100,000 operations at max. rated load	
Operating Force		4.41N　max.	
Total Travel		3mm　max.	
Weight		Square：10 g　Rectangle：11 g	
Ambient Operating Temperature		−15℃ to 50℃（No Freeze, No Condensation）	
Ambient Operating Humidity		80%RH max.（No Condensation）	
Ambient Storage Temperature		−25℃ to 65℃（No Freeze, No Condensation）	
Ambient Storage Humidity		80%RH max.（No Condensation）	

https://www.sunmulon.co.jp/english/products/switch_e/kh.html

◇Dimensions：page KH-4　◇Accessories：page KH-5　◇Ordering code：page KH-6～11
◇Internal connection arrangements：page KH-13～14　◇LED specifications：page KH-15～16　◇Terminals / PCB hole cutout：page KH-17
◇Mounting design / Panel cutout：page KH-18

SPECIFICATIONS

		Square	Rectangle
Illumination type	Full-Face	A	A
	Dual-Color	A	A
	2-Split-Face	A	A
	Non-illumination	A	A
Contact	SPDT	A	A
	DPDT	A	A
Terminal	#110 Tab Soldering	A	A
	PCB	A	A
RoHS (10 Substances)		Conform to standards	

A : Applicable N/A : Not applicable

CONTACT RATINGS

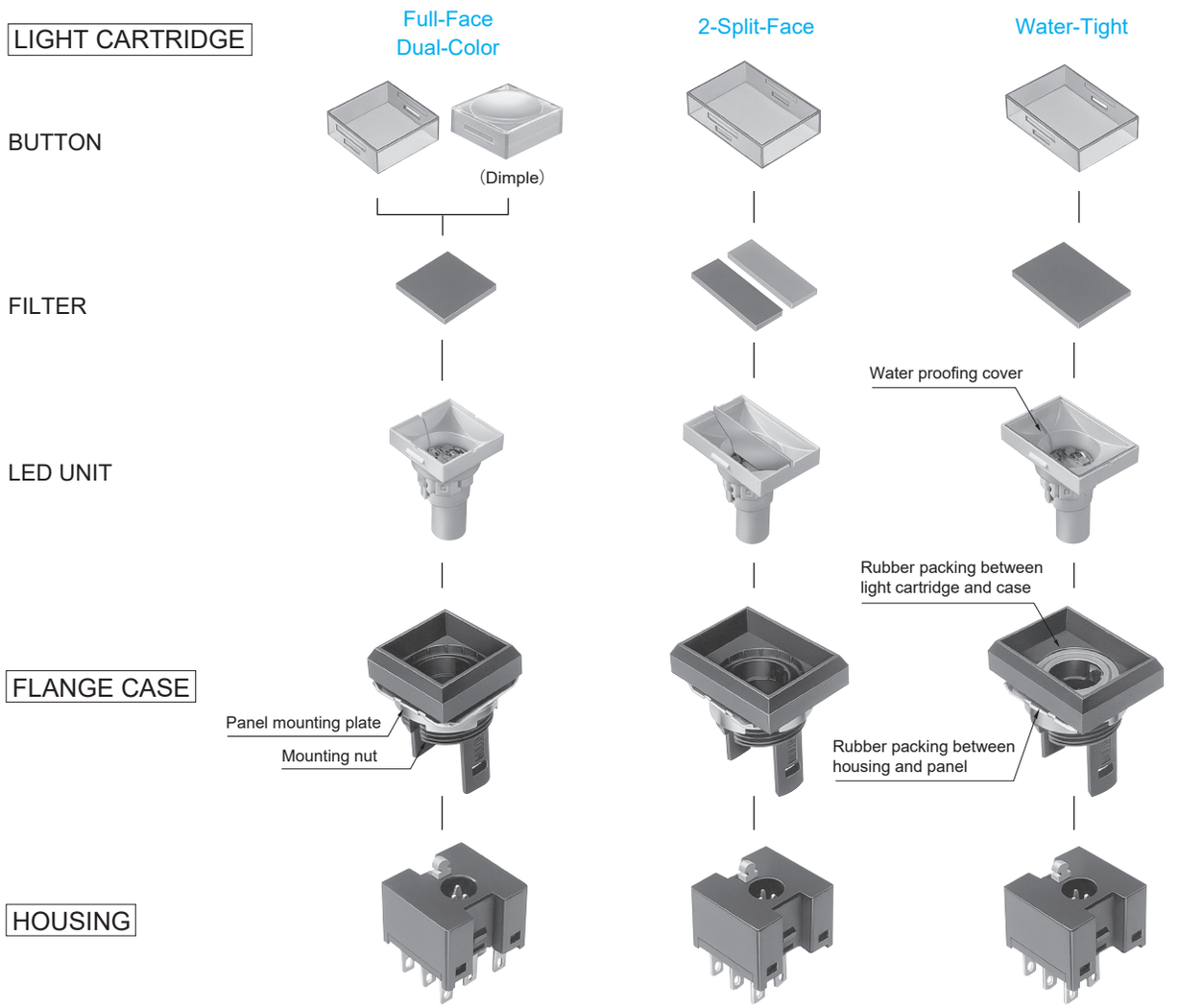
● Silver contact (Gold-plated)

Voltage	Current (A) (Resistive load)
AC 125 V	3
250 V	3
DC 8 V	3
14 V	3
30 V	2
125 V	0.4

● Cross-bar contact

Rating	AC 125 V 0.1 A (Resistive load)
	DC 30 V 0.1 A (Resistive load)
Minimum applicable load	DC 5 V 1 mA (Resistive load)

STRUCTURE



ILLUMINATION TYPES

Common for each button size.

LED color symbol

70	Red	80	Green	90	Yellow

※ Yellow (90) is actually “ORANGE Yellow” not Lemon Yellow.

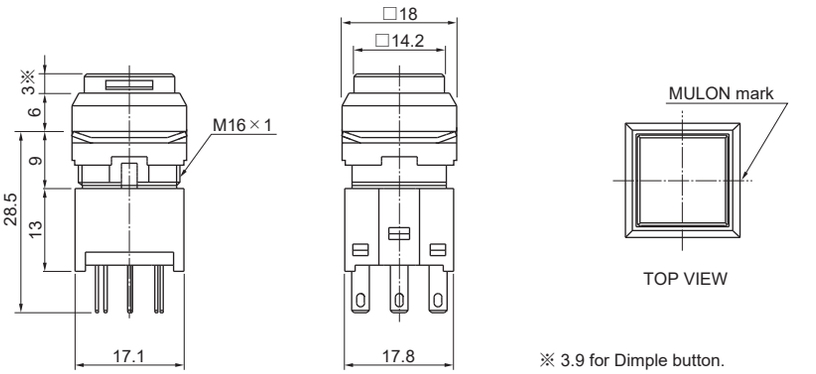
Full-Face	7 8 9
Dual-Color	7・8
2-Split-Face	7/7 7/8 7/9 8/7 8/8 8/9 9/7 9/8 9/9

DIMENSIONS

● With Flange

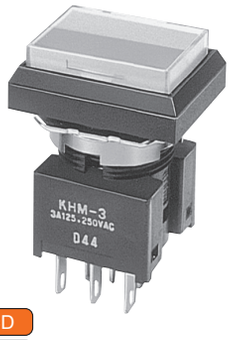
Square

3D
DXF

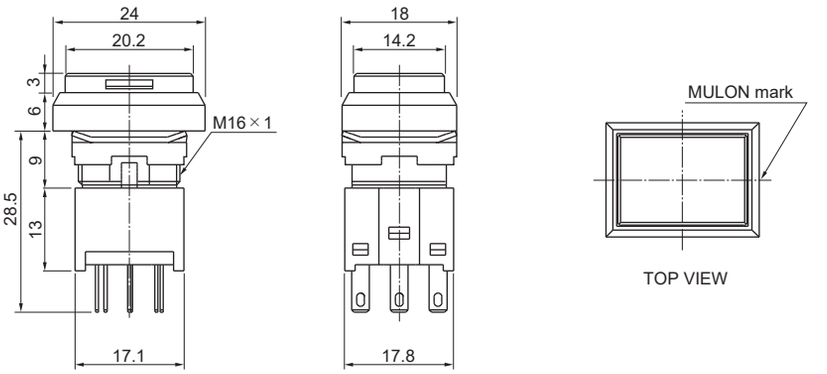


※ 3.9 for Dimple button.

Rectangle



3D
DXF



3D・DXF data download site ： **https://www.sunmulon.co.jp/download/**

Tolerance : ± 0.4 mm

ACCESSORIES

Name	Appearance	Classification	Part no.		Precautions for use
Guard cover 3D DXF		For square button	Black	KH-1565-K	- The cover to be opend 90° and stopped. Do not apply any more excessive force. - Cannot be used with Dimple button. - When a guard cover is used, it is not waterproof.
			Gray	KH-1565-H	
		For rectangle button	Black	KH-1566-K	
			Gray	KH-1566-H	
Tightening tool		For tightening flange case screw	MH-448		- Be used to tightening flange case screw.
Removing tool		For removal housing	KH-1496		- Be used to remove housing from flange case.
Removing tool		For removal light cartridge	SJ-0001		- Be used to remove light cartridge from housing.

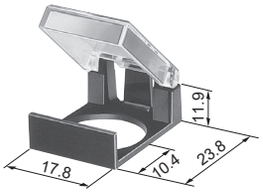
GUARD COVER

Square	Black	KH-1565-K
	Gray	KH-1565-H
Rectangle	Black	KH-1566-K
	Gray	KH-1566-H

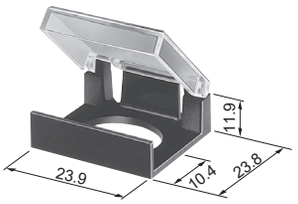
※ The cover to be opened 90° and stopped.

※ When a guard cover is used, it is not waterproof.

3D
DXF



Square



Rectangle

3D・DXF data download site ： https://www.sunmulon.co.jp/download/

Tolerance : ± 0.4 mm

ORDERING CODE 【Full-Face】

Assembled Part (Light cartridge and Housing)

KH □ — □ □ □ C □ □ □ □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● BUTTON SHAPE

S0	Square
K0	Square Dimple ※1)
W0	Rectangle

● LED COLOR

7	Red
8	Green
9	Yellow ※2)
X	Without LED

● BUTTON COLOR

C	Clear

● FLANGE CASE COLOR

K	Black
H	Gray

● TERMINAL

P	#110 Tab・Soldering
C	PCB

● FILTER COLOR

1	Red
2	Green
3	Yellow ※2)
4	Milk-white
X	Without filter

Generally, filter is necessary for clear button.

● Supply Voltage to LED

1	DC 5V Built-in resistor
2	DC12V Built-in resistor
3	DC24V Built-in resistor
4	DC 5V Non-resistor
5	DC12V・24V Non-resistor
X	Without LED

For Non-resistor type,
use external protective resistor.

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● OPTION

005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● NOTES

※1) Dimple button is only for Square button.

※2) The color of "Yellow" for LED (9) and filter (3) is actually "Orange Yellow" not Lemon Yellow.

◇Dimensions：page KH-4
◇Accessories：page KH-5
◇Internal connection arrangements：page KH-13
◇LED specifications：page KH-15
◇Terminals / PCB hole cutout：page KH-17
◇Mounting design / Panel cutout：page KH-18

ORDERING CODE 【Full-Face】

LIGHT CARTRIDGE

KH — □ □ □ □ □ □ □

● BUTTON SHAPE

S0	Square
K0	Square Dimple ※1)
W0	Rectangle

● LED COLOR

7	Red
8	Green
9	Yellow ※2)
X	Without LED

● BUTTON COLOR

C	Clear
X	Without button

● FILTER COLOR

1	Red
2	Green
3	Yellow ※2)
4	Milk-white
X	Without filter

Generally, filter is necessary for clear button.

● Supply Voltage to LED

1	DC 5V Built-in resistor
2	DC12V Built-in resistor
3	DC24V Built-in resistor
4	DC 5V Non-resistor
5	DC12V・24V Non-resistor
X	Without LED

For Non-resistor type,
use external protective resistor.

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● OPTION

005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● NOTES

※1) Dimple button is only for Square button.
※2) The color of "Yellow" for LED (9) and filter (3) is actually "Orange Yellow" not Lemon Yellow.

FLANGE CASE

KH □ — □ □ □

● OPERATION

L	Indicator
S	Momentary or Alternate

● FLANGE CASE COLOR

S	Square
W	Rectangle

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● FLANGE CASE COLOR

K	Black
H	Gray

HOUSING

KH □ — □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● TERMINAL

P	#110 Tab・Soldering
C	PCB

● ILLUMINATION TYPE

D	Full-Face
X	Non-illumination

ORDERING CODE 【Dual-Color】

Assembled Part (Light cartridge and Housing)

KH □ — □ □ 78 C □ 4 □ □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● BUTTON SHAPE

S3	Square	
K3	Square Dimple	※1)
W3	Rectangle	

● LED COLOR

78	Red・Green

● BUTTON COLOR

C	Clear

● FLANGE CASE COLOR

K	Black
H	Gray

● FILTER COLOR

4	Milk-white

● TERMINAL

P	# 110 Tab・Soldering
C	PCB

● Supply Voltage to LED

1	DC 5V Built-in resistor	
2	DC12V Built-in resistor	
3	DC24V Built-in resistor	
4	DC 5V Non-resistor	※2)
5	DC12V・24V Non-resistor	※2)

For Non-resistor type,
use external protective resistor.

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● OPTION

005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● NOTES

※1) Dimple button is only for Square button.
※2) Please select Non-resistor type and apply required external resistor for simultaneous lighting.

◇Dimensions：page KH-4
◇Accessories：page KH-5
◇Internal connection arrangements：page KH-13
◇LED specifications：page KH-15
◇Terminals / PCB hole cutout：page KH-17
◇Mounting design / Panel cutout：page KH-18

ORDERING CODE 【Dual-Color】

LIGHT CARTRIDGE

KH – □ 78 □ □ □ □ □

● BUTTON SHAPE

S3	Square
K3	Square Dimple ※1)
W3	Rectangle

● LED COLOR

78	Red・Green

● BUTTON COLOR

C	Clear
X	Without button

● FILTER COLOR

4	Milk-white
X	Without filter

Generally, filter is necessary for clear button.

● Supply Voltage to LED

1	DC 5V Built-in resistor
2	DC12V Built-in resistor
3	DC24V Built-in resistor
4	DC 5V Non-resistor ※2)
5	DC12V・24V Non-resistor ※2)

For Non-resistor type,
use external protective resistor.

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● OPTION

005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● NOTES

※1) Dimple button is only for Square button.
※2) Please select Non-resistor type and apply required external resistor for simultaneous lighting.

FLANGE CASE

KH □ – □ □ □ □

● OPERATION

L	Indicator
S	Momentary or Alternate

● FLANGE CASE COLOR

S	Square
W	Rectangle

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● FLANGE CASE COLOR

K	Black
H	Gray

HOUSING

KH □ – □ □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● TERMINAL

P	#110 Tab・Soldering
C	PCB

● ILLUMINATION TYPE

E	Dual-Color

ORDERING CODE 【2-Split-Face】

Assembled Part (Light cartridge and Housing)

KH □ — □ □ 1 2 C □ 1 2 □ □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● BUTTON SHAPE

S2	Square
K2	Square Dimple ※1)
W2	Rectangle

● LED COLOR ※2)

7	Red	Put the color numbers into frame 1, 2.
8	Green	(2-Split-Face combination)
9	Yellow	77, 78, 79, 87, 88, 89, 97, 98, 99
X	Without LED	For Non-illuminated : XX

The combinationof With LED and Wihout LED cannot be specified.

● BUTTON COLOR

C	Clear

● FLANGE CASE COLOR

K	Black
H	Gray

● FILTER COLOR ※2)

1	Red	Put the color numbers into frame 1, 2.
2	Green	
3	Yellow	
4	Milk-white	
X	Without filter	For without filter : XX

The combination of With filter and Without filter cannot be specified.

● TERMINAL

P	# 110 Tab・Soldering
C	PCB

● Supply voltage to LED

1	DC 5V Built-in resistor	
2	DC12V Built-in resistor	※3)
6	Non-resistor	※4)
X	Without LED	

For Non-resistor type, use external protective resistor.

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● OPTION

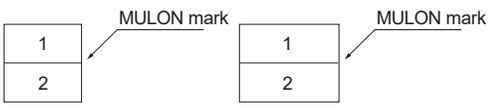
005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● NOTES

※1) Dimple button is only for Square button.

※2) How to specify the color of LED and filter
Select the color symbols listed in the ordering code, and put them into the frame 1 and 2 referring to the figure below.
The numbers in the figure match the location specified in the ordering code.
The color of "Yellow" for LED (9) and filter (3) is actually "Orange Yellow" not Lemon Yellow.



※3) Please select Non-resistor type and apply required external resistor for simultaneous lighting.

※4) DC 24V Built-in resistor type is not available. For DC 24V use, select Non-resistor type and apply required external resistor.

◇Dimensions：page KH-4
◇Accessories：page KH-5
◇Internal connection arrangements：page KH-14
◇LED specifications：page KH-16
◇Terminals / PCB hole cutout：page KH-17
◇Mounting design / Panel cutout：page KH-18

ORDERING CODE 【2-Split-Face】

LIGHT CARTRIDGE

KH — □ 1 2 □ 1 2 □ □ □

● BUTTON SHAPE

S2	Square
K2	Square Dimple ※1)
W2	Rectangle

● LED COLOR ※2)

7	Red	Put the color numbers into frame 1, 2. (2-Split-Face combination)
8	Green	
9	Yellow	77, 78, 79, 87, 88, 89, 97, 98, 99
X	Without LED	For Non-illuminated : XX

The combinationof With LED and Wihout LED cannot be specified.

● BUTTON COLOR

C	Clear
X	Without button

● FILTER COLOR ※2)

1	Red	Put the color numbers into frame 1, 2.
2	Green	
3	Yellow	
4	Milk-white	
X	Without filter	For without filter : XX

The combination of With filter and Without filter cannot be specified.

● OPTION

005	Cathode common
Blank	No option

For other options except for the above, please contact us.

● PROTECTION

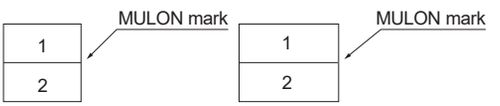
A	No Protection
B	Oil and Water-tight (IP65) version

● Supply voltage to LED

1	DC 5V Built-in resistor	
2	DC12V Built-in resistor	※3)
6	Non-resistor	※4)
X	Without LED	

For Non-resistor type, use external protective resistor.

● NOTES



※1) Dimple button is only for Square button.

※2) How to specify the color of LED and filter
Select the color symbols listed in the ordering code, and put them into the frame 1 and 2 referring to the figure on the right.
The numbers in the figure match the location specified in the ordering code.
The color of "Yellow" for LED (9) and filter (3) is actually "Orange Yellow" not Lemon Yellow.

※3) Please select Non-resistor type and apply required external resistor for simultaneous lighting.

※4) DC 24V Built-in resistor type is not available. For DC 24V use, select Non-resistor type and apply required external resistor.

FLANGE CASE

KH □ — □ □ □

● OPERATION

L	Indicator
S	Momentary or Alternate

● FLANGE CASE COLOR

S	Square
W	Rectangle

● PROTECTION

A	No Protection
B	Oil and Water-tight (IP65) version

● FLANGE CASE COLOR

K	Black
H	Gray

HOUSING

KH □ — □ □ □

● OPERATION

L	Indicator
M	Momentary
A	Alternte

● CONTACT

0	Indicator
3	SPDT・Silver (Gold-Plated)
4	DPDT・Silver (Gold-Plated)
5	SPDT・Crossbar
6	DPDT・Crossbar

● TERMINAL

P	# 110 Tab・Soldering
C	PCB

● ILLUMINATION TYPE

E	Split-Face
X	Non-illumination

REPLACEMENT PARTS

● Full-Face BUTTON／FILTER

		Red	Green	Yellow	Milk-white	Clear	Dimple
BUTTON	Square					KH-1490	KH-1597
	Rectangle					KH-1493	
FILTER	Square	KH-1491-LR	KH-1491-LG	KH-1491-LY	KH-1491-LM		
	Rectangle	KH-1494-LR	KH-1494-LG	KH-1494-LY	KH-1494-LM		

● Dual-Color BUTTON／FILTER

		Milk-white	Clear	Dimple
BUTTON	Square		KH-1490	KH-1597
	Rectangle		KH-1493	
FILTER	Square	KH-1491-LM		
	Rectangle	KH-1494-LM		

● 2-Split-Face BUTTON／FILTER

		Red	Green	Yellow	Milk-white	Clear	Dimple
BUTTON	Square					KH-1490	KH-1597
	Rectangle					KH-1493	
FILTER	Square	KH-1492-LR	KH-1492-LG	KH-1492-LY	KH-1492-LM		
	Rectangle	KH-1495-LR	KH-1495-LG	KH-1495-LY	KH-1495-LM		

● DIVIDER

Square	KH-1497-1
Rectangle	KH-1498-1

※ The water-tight type cannot replace the divider.

● Panel Mounting Plate

Part no.	KH-1473

● Mountig Nut

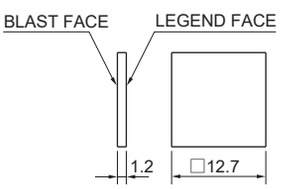
Part no.	KH-1474

● Rubber Packing

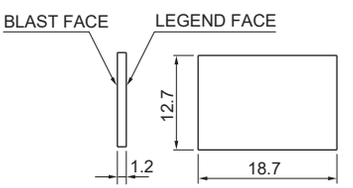
Part no.	KH-1475

Water-tight type only

FILTER DIMENSIONS



KH-1491



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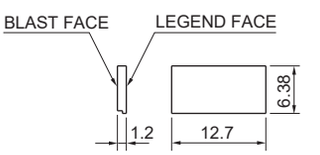
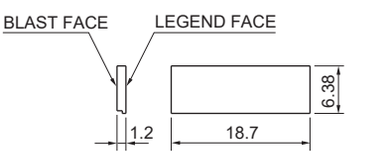


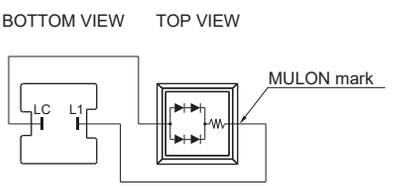
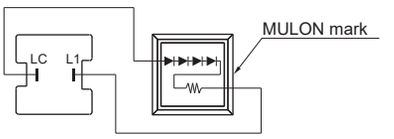
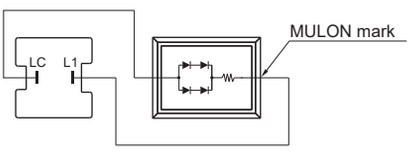
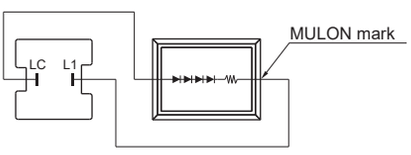
KH-1492



KH-1495

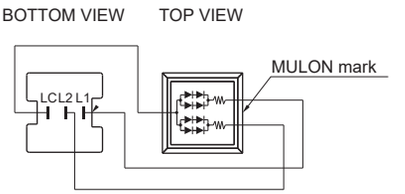
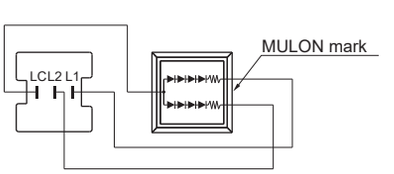
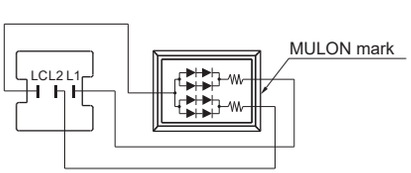
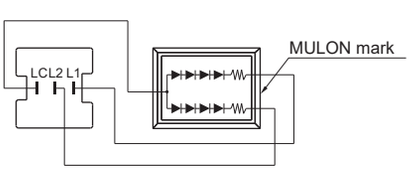
INTERNAL CONNECTION ARRANGEMENTS

● Full-Face

	Voltage	
Square	DC5V	
	DC12V DC24V	
Rectangle	DC5V	
	DC12V DC24V	

※ These are all internal connection diagrams for built-in resistor type.
※ For Non-resistor type, the resistor part in the diagram should be short- circuited.
※ The common diagram is for Anode Common type. For Cathode Common type, LED polarity (current flow direction) is opposite.

● Dual-Color

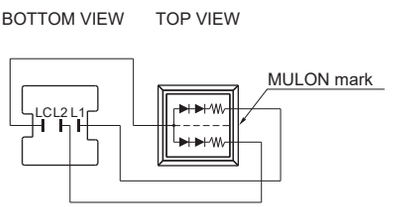
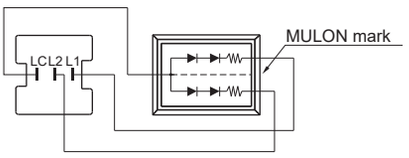
	Voltage	
Square	DC5V	
	DC12V DC24V	
Rectangle	DC5V	
	DC12V DC24V	

● Dual-Color combination (Common for each voltage)

Terminals	LED Color
LC-L1	Green
LC-L2	Red

INTERNAL CONNECTION ARRANGEMENTS

● 2-Split-Face

	Voltage	
Square	DC5V DC12V	
Rectangle	DC5V DC12V	

※ These are all internal connection diagrams for built-in resistor type.

※ For Non-resistor type, the resistor part in the diagram should be short- circuited.

※ The common diagram is for Anode Common type. For Cathode Common type, LED polarity (current flow direction) is opposite.

LED SPECIFICATIONS 【Full-Face】

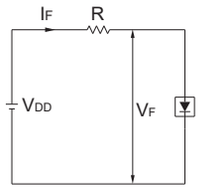
● BUILT-IN RESISTOR

Voltage	Rated Current (mA)
DC5V ±5%	32
DC12V ±5%	16
DC24V ±5%	12

● NON-RESISTOR (EXTERNAL RESISTOR)

Supply Voltage		DC5V			DC12V・24V		
LED Color		Red	Green	Yellow	Red	Green	Yellow
Max. Forward Current I_{FM}	(mA)	40	40	40	20	20	20
DC Reverse Voltage V_R	(V)	10	10	10	20	20	20
Forward Voltage V_F (Typ.) 【IF=20mA】	(V)	3.6	4.3	4.0	7.1	8.6	8.0
Derating (Operating temperature) (over 25℃ working temperature)	(mA/℃)	0.66			0.33		
Pulse Lighting: Pulse Width PW	(μs)				100		
Pulse Lighting: Duty Ratio DR					10^{-1}		
Pulse Lighting: I_{FM}	(mA)				90		

● Wiring Diagram



Refer to the following formula
to calculate external resistance values.

$$R = \frac{V_{DD} - V_F}{I_F}$$

V_{DD} : Supply Voltage
V_F : Forward Voltage
I_F : Forward Current

I_F (Forward Current) : Refer to the Rated Current of BUILT-IN RESISTOR type, and be sure to set less than I_{FM} (Max. Forward Current).

LED SPECIFICATIONS 【Dual-Color】

● BUILT-IN RESISTOR

Voltage	Rated Current (mA)	
	Red	Green
DC5V ±5%	7	26
DC12V ±5%	4	14
DC24V ±5%	2	7

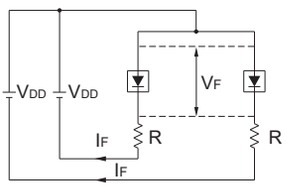
Built-in resistor type cannot be simultaneous lighting.

● NON-RESISTOR (EXTERNAL RESISTOR)

Supply Voltage		DC5V		DC12V・24V	
LED Color		Red	Green	Red	Green
Max. Forward Current I_{FM}	(mA)	50	40	25	20
DC Reverse Voltage V_R	(V)	10	10	20	20
Forward Voltage V_F (Typ.)	(V)	3.8	4.2	7.6	8.4
Derating (Operating temperature) (over 25℃ working temperature)	(mA/℃)	0.66		0.33	
Pulse Lighting: Pulse Width PW	(μs)			100	
Pulse Lighting: Duty Ratio DR				10^{-1}	
Pulse Lighting: I_{FM}	(mA)			90	

Please use the following conditions and apply required external resistor for Simultaneous lighting.
DC5V : Total 40mA or less
DC12, 24V : Total 20mA or less

● Wiring Diagram



Refer to the following formula
to calculate external resistance values.

$$R = \frac{V_{DD} - V_F}{I_F}$$

V_{DD} : Supply Voltage
V_F : Forward Voltage
I_F : Forward Current

I_F (Forward Current) : Refer to the Rated Current of BUILT-IN RESISTOR type, and be sure to set less than I_{FM} (Max. Forward Current).

For resistance value calculation
https://www.sunmulon.co.jp/english/products/led.html
The resistance value can be calculated just by entering the items.

LED SPECIFICATIONS 【2-Split-Face】

● BUILT-IN RESISTOR

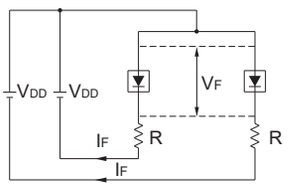
Voltage	Rated Current (mA)
DC5V ±5%	16
DC12V ±5%	16

Built-in resistor DC 5V type can be simultaneous lighting.
Built-in resistor DC12V type cannot be simultaneous lighting.

● NON-RESISTOR (EXTERNAL RESISTOR)

Supply Voltage		DC5V・12V・24V		
LED Color		Red	Green	Yellow
Max. Forward Current I_{FM} (mA)		20	20	20
DC Reverse Voltage V_R (V)		10	10	10
Forward Voltage V_F (Typ.) 【IF=20mA】(V)		3.6	4.3	4.0
Derating (Operating temperature) (over 25℃ working temperature) (mA/℃)		0.66		
Pulse Lighting	Pulse Width PW (μs)	100		
	Duty Ratio DR	10^{-1}		
	I_{FM} (mA)	90		

● Wiring Diagram



Refer to the following formula
to calculate external resistance values.

$$R = \frac{V_{DD} - V_F}{I_F}$$

V_{DD} : Supply Voltage
V_F : Forward Voltage
I_F : Forward Current

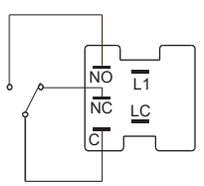
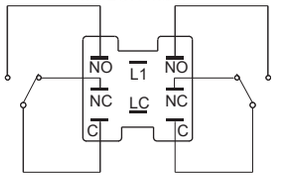
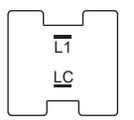
For resistance value calculation
https://www.sunmulon.co.jp/english/products/led.html
The resistance value can be calculated just by entering the items.

I_F (Forward Current) : Refer to the Rated Current of BUILT-IN RESISTOR type, and be sure to set less than I_{FM} (Max. Forward Current).

TERMINALS／PCB HOLE CUTOUT

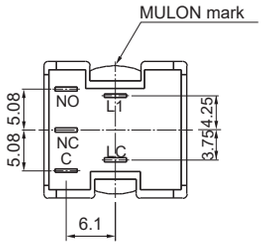
■ Full-Face

● TERMINALS LAYOUT（BOTTOM VIEW）

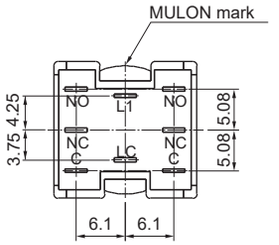
SPDT	DPDT	INDICATOR
MULON mark	MULON mark	MULON mark
		

※ When “Without LED (X)” is specified, there is no LED terminal (L1, LC).

● TERMINALS DIMENSIONS（BOTTOM VIEW）

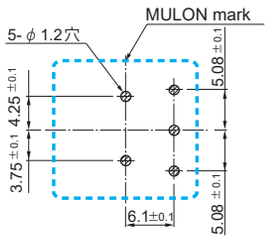


SPDT

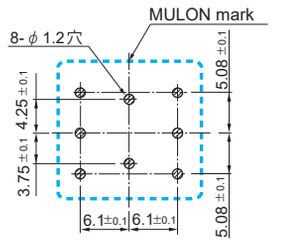


DPDT

● PCB hole cut-out（TOP VIEW）



SPDT

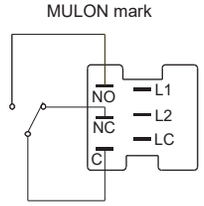
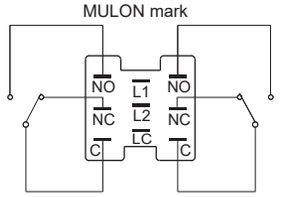
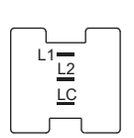


DPDT

※ When “Without LED (X)” is specified, there is no LED terminal (L1, LC).

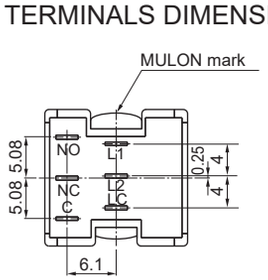
■ Dual-Color • 2-Split-Face

● TERMINALS LAYOUT（BOTTOM VIEW）

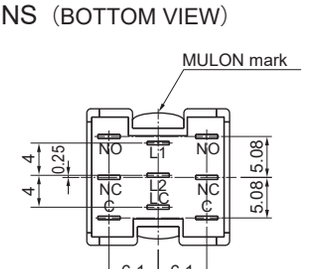
SPDT	DPDT	INDICATOR
MULON mark	MULON mark	MULON mark
		

※ When “Without LED (X)” is specified, there is no LED terminal (L1, L2, LC).

● TERMINALS DIMENSIONS（BOTTOM VIEW）

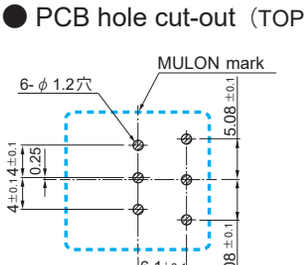


SPDT

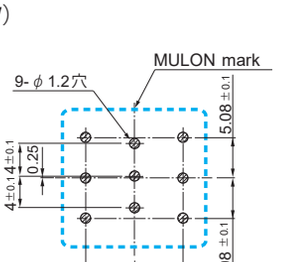


DPDT

● PCB hole cut-out（TOP VIEW）



SPDT

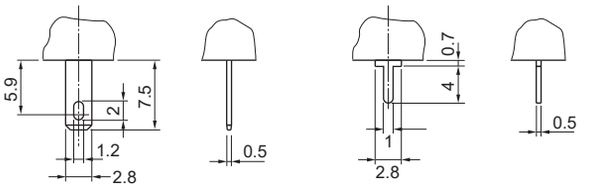


DPDT

※ When “Without LED (X)” is specified, there is no LED terminal (L1, L2, LC).

Tolerance : ± 0.4 mm

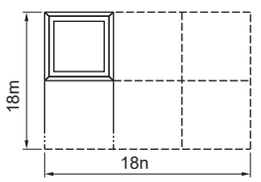
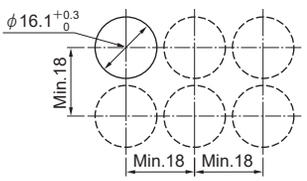
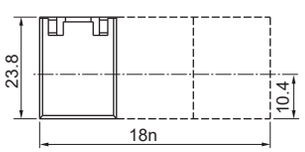
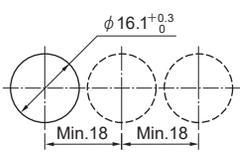
TERMINAL SHAPE



#110 Tab・Soldering Terminal　　PCB Terminal

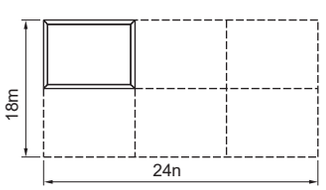
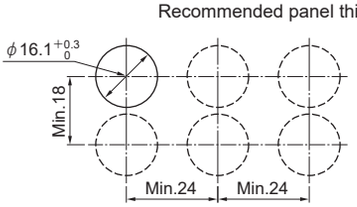
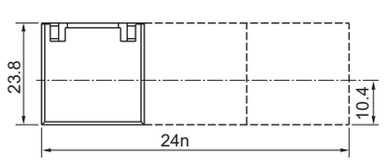
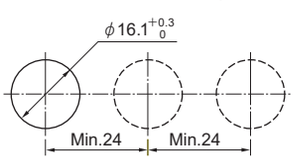
MOUNTING DESIGN／PANEL CUTOUT

● Square

	Mounting design	Panel cutout
Without Guard cover		Recommended panel thickness : 0.5 to 3.2 mm 
With Guard cover		Recommended panel thickness : 0.5 to 2.2 mm 

n : Number of Units (Horizontal)　m : Number of Units (Vertical)

● Rectangle

	Mounting design	Panel cutout
Without Guard cover		Recommended panel thickness : 0.5 to 3.2 mm 
With Guard cover		Recommended panel thickness : 0.5 to 2.2 mm 

n : Number of Units (Horizontal)　m : Number of Units (Vertical)

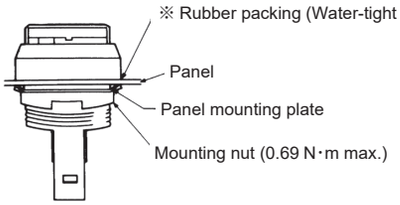
※ If the panel is to be finished (e.g. coated), make sure that the panel meets the specified dimensions after the coating.
In case the panel cut dimension is too small, it may cause malfunction.
※ Recommended panel thickness of Water-tight type is 0.5 to 2.7 mm without guard cover.
※ After the panel-cutting process, make sure to remove burrs on the surface.

Tolerance : ± 0.4 mm

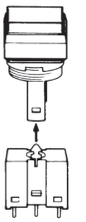
ASSEMBLY & DISASSEMBLY

1. Insert Flange case and Housing

(1) Insert the flange case from the front of the panel, and fit the panel mounting plate from rear and tighten the mounting nut to recommended tightening torque (0.69 N･m max.) with the tightening tool (MH-448).



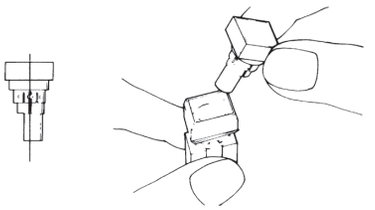
(2) Align each joint of the flange case and the housing with the correct orientation (MULON mark and L1) and push in until click.
Finally, push the light cartridge into the operating position until click.



※ Pushing it in backwards may cause subsequent malfunctions.

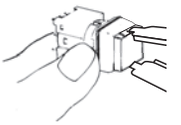
2. Fitting Light cartridge

Align the long tab of the LED unit with the hole in the housing and push it in until it stops. It only goes in one direction.



3. Removing Light cartridge

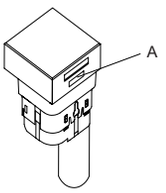
Be sure to remove with the removing tool (SJ-0001).
Hang the cartridge with the removing tool in the groove, and pull it straight out.



※ In case removing in any other way than the above, it may cause damage to light cartridge.
※ Do not touch the other parts such as spring incorporated in light cartridge.

4. Removing Button

Remove the part A by pushing it open.



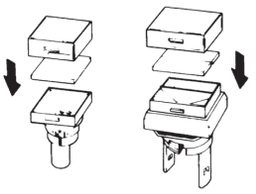
Do not reuse buttons that have been removed and deformed.

5. Fitting Divider (Split-Face)

Insert the divider into the groove inside the LED unit except for water-tight type.

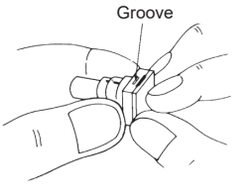
6. Fitting Filter

Place the filter with the blasted side down on the LED unit, then put button on it.



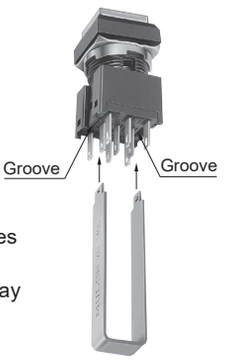
7. Fitting Button

Align the groove on the button, the projection on the LED unit, and fit the button until click.



8. Removing Housing and Flange case

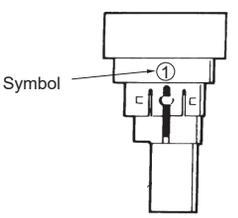
Place the removing tool (KH-1496) into the two grooves and push it in until click.
Pull it out to remove the Housing.



Push the removing tool into the two grooves at the same time.
Pushing in one side at a time or forcibly may damage the flange case.

9. Indication of rated voltage

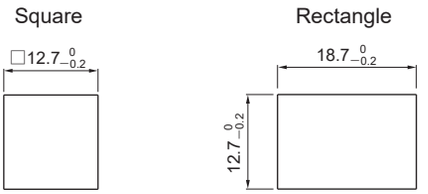
The rated voltage symbol is shown on the side of the LED unit.



Symbol	Voltage
1	DC 5V Built-in resistor
2	DC12V Built-in resistor
3	DC24V Built-in resistor
4	DC 5V Non-resistor
5	DC12V,24V Non-resistor
6	Non-resistor (Split- Face)
X	Without LED

PRECAUTIONS FOR CORRECT USE

1. Solder quickly and correctly at 380℃ max. and for 3 seconds or less.
   Be careful not to touch the soldering iron to the main body.
2. Wait for one minute during and after soldering before exerting any external force on the solder.
3. The rated voltage is shown on the resistor board and on the side of the light cartridge, so be sure before use.
4. Character films are not included.
   If preparing the character film separately, use a heat-resistant film with a thickness of 0.1 mm.
   For dimensions, please refer to the figure below.
5. The tightening torque of the mounting nut when attaching to the panel should be 0.69 N･m or less.



※ For handling instructions and precautions other than the above, please refer to “Safety Precautions for All Illuminated Pushbutton Switches”.

Tolerance : ± 0.4 mm

As of June 2023

Safety Precautions for All Illuminted Pushbutton Switches

1. Notes on contents of Catalogs

(1) Rated values, performance values, and specification values of Sumulon products listed in this catalog are values acquired under respective conditions in independent testing, and do not guarantee values gained in combined conditions.

(2) The ambient operating temperature(humidity) is guaranteed by evaluation based on characteristics, and does not guarantee continuous use for a long period of time near the upper or lower limit of the ambient operating temperature(humidity) or permanent use at that temperature(humidity).

(3) Reference data and reference values listed in catalogs are for reference purposes only, and do not guarantee that the product will always operate appropriately in that range.

(4) The specifications / appearance and accessories of Sunmulon products listed in catalogs are subject to change or termination of sales without notice, for improvemnet or other reasons.

(5) The content of catalogs is subject to change without notice.

2. Note on applications

(1) If using Sunmulon products in combination with other products, confirm the following suitability by yourself. Sunmulon shall provide no guarantees regarding the combination suitability.
(a) Regulations, satndards, or laws to which your machinery, equipment, ect. must conform
(b) Functionality and safety of your machinery and equipment

(2) Wiring and installation that ensures the Sunmulon product used in your system, machine, device, or the like can perform and function according to its specifications.

(3) When using Sunmulon products, be cautious when implementing the following.
(a) Use of Sunmulon products with sufficient allowance for rating and performance.
(b) Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that Sumulon product fails.

(4) Sunmulon products are designed and manufactured as general-purpose products for general industrial products. They are not intended for use in the following applications, and in the event that you use Sunmulon product for these applications, unless otherwise agreed upon between you and Sunmulon, Sunmulon shall provide no guarantees whatsoever regarding Sunmulon products.
(a) Safety devices intended for human body protection
(b) Direct control of transport equipmnt (railroads / airplanes / ships / vehicles / vehicle instruments, etc.)
(c) Space equipment, submarine equipment
(d) Nuclear power control equipment, radiation related equipment
(e) Combustion equipment, electric heat equipment
(f) Disaster prevention and security equipment
(g) Elevating equipment
(h) Amusement facilities
(i) Facilities subject to government or industry regulations
(j) Use in applications that require a high degree of safety, any other equipment, instruments, or the like that could endanger life or human health

3. Warranty

(1) The warranty period for Sunmulon products shall be 1 year after purchase or delivery to the specified location.

(2) Warranty scope should a failure occur in Sunmulon product during the above warranty period for reasons attributable to Sunmulon, then Sunmulon shall provide that product, free of charge, the same quantity. Further, in no event shall liability of Sunmulon exceed the individual price of the product on which liability is asserted.

(3) Failures cause by the following reasons shall be deemed outside the scope of this warranty.
(a) The product was handled or used deviating from conditions / environment listed in the catalogs
(b) The failure was caused by reasons other than Sunmulon product
(c) Modification or repair was performed by a party other than Sunmulon
(d) Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user's manual and catalogs
(e) The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from Sunmulon
(f) The failure was due to other causes not attributable to Sunmulon (including cases of force majeure such as natural disasters and other disasters)

(4) The warranty listed in this Safety Precautions is the full and complete warranty for Sunmulon products, and Sunmulon shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to Sunmulon product.

4. Handling precautions for switch

(1) Do not perform wiring with power supplied to the switch. Do not touch the terminals or other charged parts of the switch while power is being supplied. Doing so may result in electric shock.

(2) Be careful of electrostatic breakdown when handling.

(3) Do not drop or otherwise apply strong force to the switch.

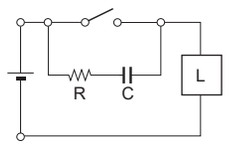
(4) Do not place heavy objects on the switch.

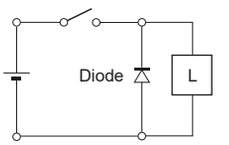
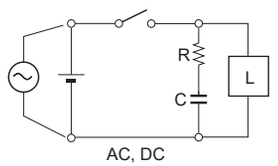
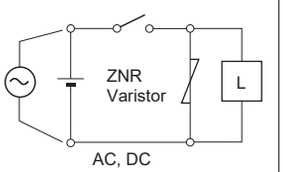
(5) Do not operate or use the housing (switch unit) by itself. Use the switch with assembled the illuminated part (LED module or button).

(6) Pushbutton switches are designed to be operated by fingertips. Operating the switch using a sharp object (screwdrivers, tweezers, etc.), hard object (metal, etc.), or with a large or sudden force, may cause deform or damage the switch.

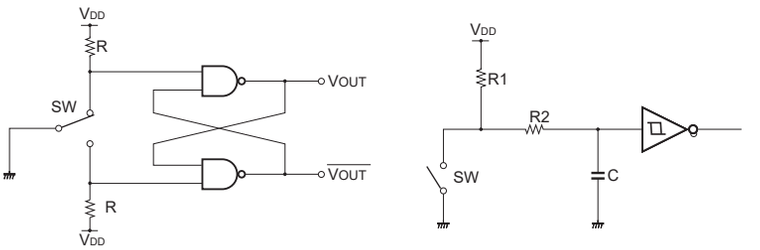
(7) Do not use the switch under loads that exceed the rated switching capacity or other contact ratings. Doing so may result in welding of the contact, or burnout accidents.

(8) For inductive load, the arc by back EMF may cause contact failure. Insertion of arc prevention circuit as the following is recommended.

<table>
<tr><th>Circuit</th><th>Element selection</th><th>Circuit</th><th>Element selection</th></tr>
<tr><td> 
</td><td rowspan="2">C：1 to 0.5 μF × switch current (A)
R：0.5 to 1 Ω × switch voltage (V)

The values may change according to the characteristics of the load. Determine ideal capacitance and resistance values through testing.</td><td> 
</td><td>The diode must withstand a peak inverse voltage 4 times higher than the power supply voltage and regarding a forward current must as high or higher than the load current.</td></tr>
<tr><td> 
</td><td> 
</td><td>Use a varistor that can withstand the power supply voltage sufficiently. (1.5 times or more)</td></tr>
</table>

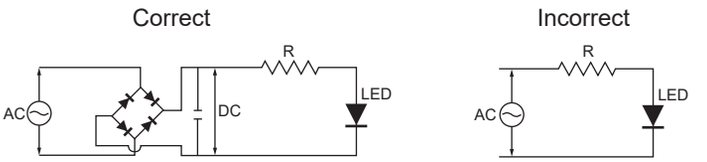
(9) Following circuits show examples of an anti-chattering circuit.



(10) Illumination

(a) Do not apply a voltage between the LED terminal that is greater than the rated voltage. Doing so may damage the LED, cause lighting failure.

(b) LEDs cannot be lit directly by AC circuit should be provided rectifier smoothing circuit for products other than AC input type.



(c) When wiring, pay attention to the polarity of the terminals.

(d) Simultaneous lighting may not be possible with Dual-Color illumination or Split-Face illumination (2, 3, or 4 split illumination), check the catalog.

(e) Apply voltage directly to LEDs of Non-built-in resistor type will damage the LEDs, so connect an appropriate external resistor.

(11) Wiring

(a) Do not apply a soldering iron to the switch housing. Doing so may deform the terminals and cause defects.

(b) See catalog for models compatible with flux prevention measures terminal. Be careful not to allow flux to panetrate sliding parts such as buttons. Use non-corrosive rosin solution as flux for dip soldering.

(c) For soldering other than flux-preventive models, hand solder with the terminals facing down to prevent flux from penetrating into the switch.

(d) The housing of KA, K2, and K9 series are designed for reflow soldering.

(e) Use the appropriate wire size for the applied voltage and current, and solder properly. Use of the product with incomplete soldering may cause abnormal heat generation, resulting in a fire hazard.

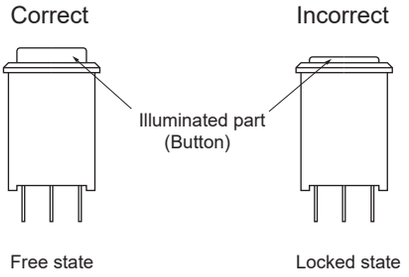
(f) After wiring is completed, maintain an appropriate insulation distance.

(12) Usage environment
(a) Do not use in the presence of flammable or explosive gases such as gasoline, thinner, LPG, etc.
(b) Avoid using the product in places where corrosive or silicon gas is generated, high temperature, high humidity, sea breeze or direct sunlight.
(c) Provide appropriate protection when using the product in places where it is exposed to water, oil, metal powder, or dust.
(d) Do not use the product in a place subject to vibration or shock. It may cause malfunction or damage.
(e) When installed in a close grouping or continuously lit, the ambient temperature may exceed the specified value due to heat generation. Take measures such as ventilation and lowering the operating voltage.
(f) When checking the actual equipment, load conditions and operating environment should be the same as the actual operating conditions.
(g) The ambient temperature for storage is －25℃ to 65 ℃ (No freeze, no condensation).

(13) When wiping off dirt on the exterior of the switch and accessories such as side plates, wipe lightly with a soft, dry cloth. Organic solvents such as thinner, benzene, alcohol, or other acidic chemicals may cause deformation, discoloration, or malfunction.

(14) Store the product away from malignant gases, dust, high temperature and high humidity, and keep it in our packing condition.

(15) When removing the illuminated part (or button) from the alternate switch housing, switch state should be in a free state.



Removal in a locked state may cause malfunction or damage to alternate switch.

(16) Periodic inspection and replacement
(a) Although mechanical and electrical durability are listed in the specifications column, deterioration of various parts (deterioration of resins and corrosion of metal parts) is possible due to the operating environment and method of use. We ask that you implement inspections for Sunmulon products to prevent accidents from occurring by conducting periodic inspections and replacements.
(b) When the switch is left unused or stored for long periods, contact reliability may deteriorate due to oxidation of contacts, which may cause continuity failure, etc. Therefore, it is necessary to check the operation before use.

(17) Service scope
The price of Sunmulon products do not include the cost of services, such as dispatching technicians.